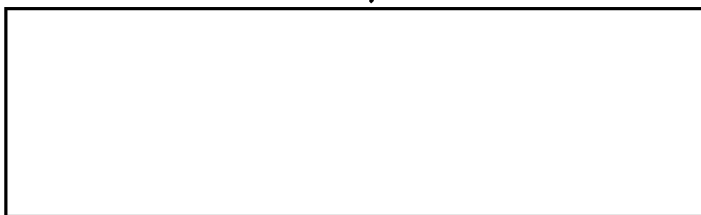


Evaluating Human Source Intelligence

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Introduction and Acknowledgments

The following notes and related handouts are intended to provide participants with "hard-copy" materials covering some of the issues to be discussed in the seminar. The seminar is "exploratory" in nature and may produce more questions than answers at this time.

I have had the benefit of discussions and briefings with intelligence community members from CIA, DIA, and the Department of State as background preparation for this seminar. It is clear that the time committed has allowed for only a brief glimpse of a large and complex "system", however, the time spent should aid in better focusing my concepts and tools of evaluation onto the concerns of the community.

I thank those who have given their time and efforts to prepare me and hope the seminar will repay them in part.

[Redacted Signature]

Consultant

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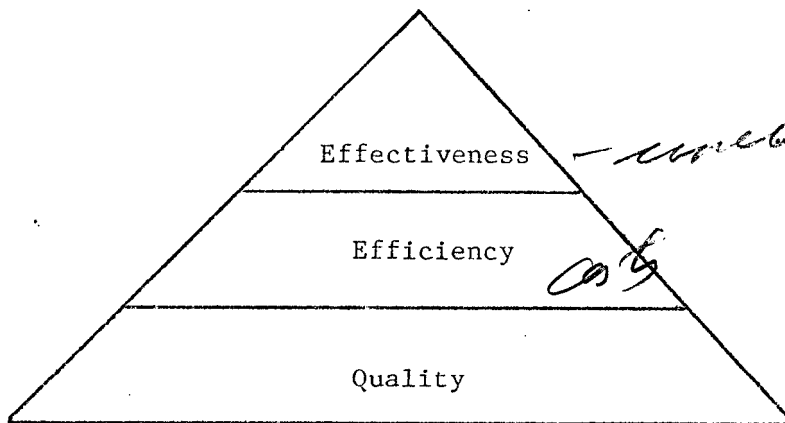
1. Framework For Evaluation

A. Concepts and Terms

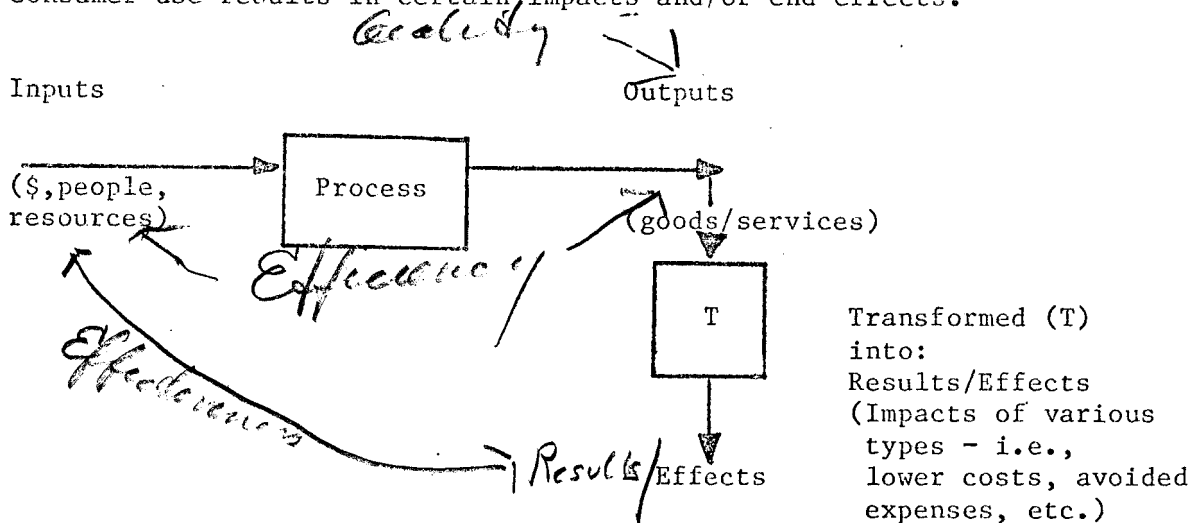
Analysis = future oriented - which alternative/option to choose and why?

Evaluation = present to past orientation - what have we got? How have we done?

Evaluation is concerned with three related, but distinct aspects that "build" upward in a hierarchal fashion:



How these aspects relate can be shown in a general "model" of any activity (field reporting for example) as a flow processing system that "produces" certain goods or services which are then used by end "consumers". The consumer use results in certain impacts and/or end effects.



B. Quality

Evaluation of Quality would concern itself with the Output(s):

- definition of output - what is the unit "produced" (goods, service)? How will I know an output unit?
- attributes of the output (implicit in the definition of the unit is the concept of "quality" - what perceivable attributes will be taken as making up an acceptable unit of output)?

The attributes that represent "quality" of the output unit should be, but often are not, as specific, measurable, and quantifiable as possible.

C. Efficiency

Evaluation of Efficiency concerns itself with the relationship between the Output(s) and Input(s). These are the general categories of efficiency evaluation or assessment:

1. Work Measurement (WM) - relates the human resources (hours, months, years) "consumed" in the production of a unit of output.
Standard rate
2. Unit Cost (UC) - relates the cost of all accountable and allocatable resources to the production of a unit.
3. Productivity Index (PI) - relates any "meaningful" measure of output to any measure of input.

Although these three forms of efficiency evaluation may appear in different ways there are only the three basic forms given above.

D. Effectiveness

Evaluation of Effectiveness requires that the "results" and/or "effects" of the outputs be considered. There are, perhaps surprisingly, only two approaches that are available to evaluate effectiveness:

Cost-effectiveness - the relationship of results to stated objectives.

Benefit-cost - the relationship between the "value" of the results/effects obtained (benefits) and the "value" of the resources (inputs) consumed (costs).

Efficiency is a relative measure - allows for comparison to a standard, process, or other operation.
Effectiveness Both require "proof" of outputs having a result or effect. Allows for evaluation of all alternatives.

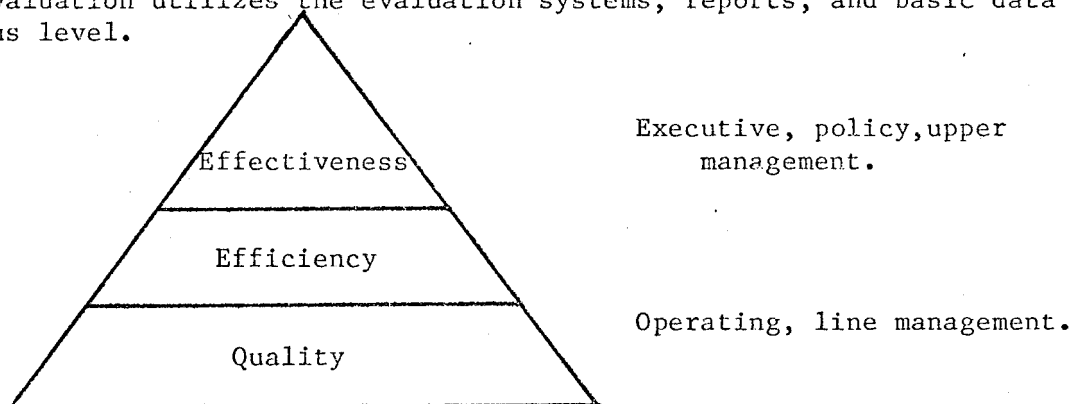
In cost-effectiveness analysis the stated objectives should be result related - not output orientated (often this is not true). Benefit-cost analysis requires the "valuation" (via shadow prices) of both resources (inputs) and the results/ effects "produced" by the outputs. There are two issues in the evaluation of effectiveness:

- do your outputs "produce" a result/effect?
- does your effect have "value"?

| Approach | Effect? | Value? |
|----------------|---------|--------|
| Cost-Effective | Yes | No |
| Benefit-Cost | Yes | Yes |

E. Evaluation - A Management System

The three aspects of evaluation provide management with different items of information at different organizational levels. Different management levels within the intelligence community would require different evaluation information. However, the provision of such information should be approached through the development of a hierarchically structured, integrated system where each level of evaluation utilizes the evaluation systems, reports, and basic data of the previous level.



II. Evaluation and Quantification - Methods, Tools, and Issues

A. Objectives - Definition and Focus.

Objectives must be capable of tangible measurement.

- Goal - General desired state or condition. = *Policy Guidance*
Not directly measurable, relatively timeless.
Objective - Specific, tangible, measurable
(time, amount, etc) result.

Examples:

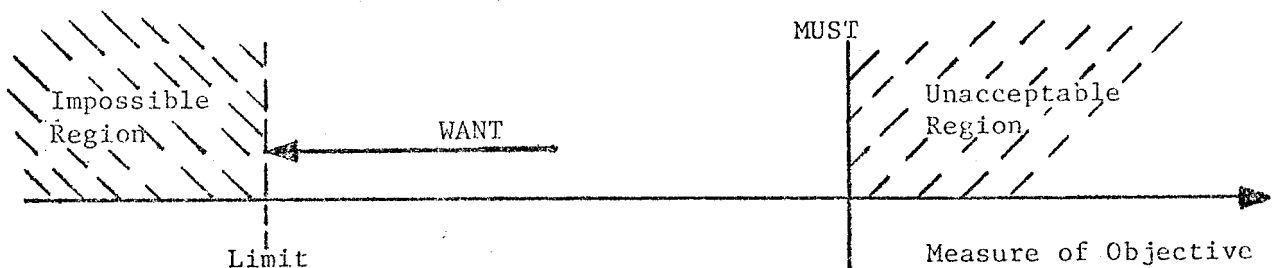
- Goal - Promote general well-being and welfare
of the public.
Objective - Reduce heroine addiction in N.Y.C.
area to or below the 1960 level.
- Goal - Stabilize Middle East political situation
in relation to USA interests.
Objective - Report at least 90% of all planned,
anti-Shah demonstrations that involve
over 1000 participants at least 12 hours
before their initiation.

There are only two classes of objectives:

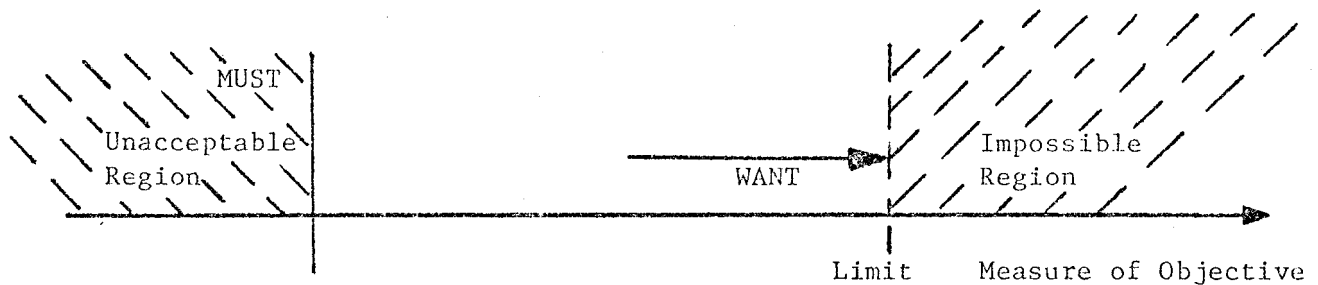
- (a) Musts - These are absolute. They cannot be compromised; they must be totally achieved as stated. The objective sets a boundary, one side of which is acceptable and the other side of which is not.
- (b) Wants - These are relative. They can be compromised; they are not requirements and they may be traded off. The objective sets a range or region. One end of the region being the more "wanted".

The Must and Want objectives may appear in two formats:

- (a) Upper-bound Must -



(b) Lower-bound Must -



The term "objective(s)" is too broad and needs a focus when evaluation is being considered. Objectives can be related to Inputs, Outputs, Outputs/Inputs, or Results.

Examples:

- Input - The agency will not expend more than \$X on reporting related to XYZ in FY-79.
- Output - At least five reports on XYZ will be submitted in 3rd quarter 1979.
- Output/Input - The five reports on XYZ will be written using no more than 6 man-months of ABC staff time.
- Result - Reporting on XYZ will increase DEA intercepts of cocaine shipments into N.Y.C. port areas by 5% over FY-77.

B. Quality.

The evaluation of quality requires that:

1. The output units (goods and/or services) be identified and defined: "The manager of the decision unit should include in a statement of objectives information relating to both the services or products to be provided by the decision unit and the contribution of that output to achievement of the principal missions toward which the unit's efforts are directed." [OMB A-115, 5/5/78]
2. Quality measures (attributes) be stated and defined - this is implicit in the definition of the output unit. The attributes should be as quantifiable and objective as possible, however, subjective attributes will often be necessary or unavoidable. Note that the quality measures (attributes) have similar characteristics to objectives and, in fact, may be stated as objectives regarding the unit of output.

Example - It is the agency objective(s) that all field reporting be:

- timely
- in response to requirements
- reliable information
- valuable
- of useful nature [Ref. DD Form 1480]

Note - To make the above attributes operational as measures of quality they would require:

- further definition or
- selection of (reference to) a "judge".

Taken together the set of attributes define the output unit. Any thing (good/service) which meets the minimal level of attributes is by definition a unit of output - if it does not, then it is not an output.

The set of attributes used to evaluate quality consists, in most cases, of separate attributes of varying importance to the evaluator or decision maker. There are tools available to determine the relative importance of the attributes to the evaluator (paired weighting technique, rank correlation methods).

The evaluation of quality is the composite of how an output item performs against the attribute and the importance of the attribute (the decision matrix technique would apply).

C. Efficiency.

The measurement of project or program efficiency is concerned with three basic areas:

1. Work Measurement - the development of standard rates or times for the accomplishment of a defined work unit. The standard rate is defined as the amount of time (hours, minutes, seconds) required to produce a work unit. The work unit must be easily counted and verified, consistent over time, and similar in content throughout the organization. Knowledge of the standard rate and the total work units required per time period (day, week, month) allows management to convert a particular work load into a statement of the human resources (people) required to produce the work load - justify staffing levels and allocations.

There are two approaches to the establishment of Work Measurement standard rates:

- (a) Engineered Techniques -
 - Time Studies:
 - Stopwatch
 - Micromotion
 - Synthesized Time Systems:
 - Predetermined Standards
 - Standard Data
 - Work Sampling
- (b) Nonengineered Techniques -
 - Job Tickets
 - Historical:
 - Time Logs
 - Time Ladder
 - Record Analysis (statistical)
 - Estimating:
 - Staffing Patterns
 - Judgemental System

The Nonengineered Techniques are most likely to be relevant to Field Reporting-Human Source Intelligence.

2. Unit Cost Measurement - the relation of the output to the cost of resources consumed in producing that unit. The usual practice is to include all costs directly attributed to the production of the output unit plus an allocation of all other, indirect costs. Therefore, unit costs may include, in addition to direct labor (people) cost, the direct cost of supplies, travel, equipment, and facilities, plus a per unit allocation of indirect costs such as administration, overhead, research, development, and training.

The costs may be expressed in any meaningful measure that management desires, but is generally a monetary unit (\$). The monetary unit is often "adjusted" to account for inflation/deflation and expressed as constant-dollars of a base year.

3. Productivity Index Measurement - the relationship between a measure of output and one or more associated inputs - the units of output and input need not be common and usually are not. The Productivity Index may be based on any meaningful ratio of output measure (goods, services) to input measure management finds appropriate. The ratio may be based upon the amount of direct human inputs only (the inverse of the standard rate) or upon the costs of all inputs (the inverse of the Unit Cost).

Each measure builds on the other. Work Measurement, the primary level of efficiency, deals with direct people resources (time) per unit of output. Unit Cost Measurement deals with all costs required to produce the output and, therefore, it is not limited to just personnel costs. However, Unit Cost Measurement builds on Work Measurement in that Work Measurement is used to support the acceptability of direct people (personnel) costs.

D. Relative Efficiency.

The evaluation of efficiency can be undertaken from one, all, or any combination of the three viewpoints above - Work, Unit Cost, Productivity Index Measurement. The concept of "efficiency" is relative to both the viewpoint taken and the base chosen for comparison. The definitions for "efficiency" are:

(1) Work Measurement:

$$\text{"Efficiency"} = (\text{Earned Hours})/(\text{Actual Hours})$$

$$\text{Where: Earned Hours} = \text{Units Output} \times \text{Standard Rate}$$

(2) Unit Cost Measurement:

$$\text{"Efficiency"} = (\text{Standard Cost/Unit})/(\text{Actual Cost/Unit})$$

Where:

$$\begin{aligned} \text{Standard Cost/Unit} &= \text{Standard Rate (hours/unit)} \\ &\times \text{Standard Cost/Hour (\$/hour)} \end{aligned}$$

(3) Productivity Index:

$$\text{"Efficiency"} = \text{Outputs/Inputs}$$

Where:

Outputs and inputs can be in any meaningful unit - usually not the same. Often stated as:

$$(\text{Units Output})/(\text{Actual Cost Total})$$

or

$$(\text{Units Output})/(\text{Actual Hours Total})$$

Efficiency, when defined from a Work or Unit Cost Measurement viewpoint, will be a dimensionless ratio that could be less than, equal to, or greater than one (1.0). This ratio has meaning only relative to and in comparison with the standard (earned hours or standard cost/unit) being employed. From the Productivity Index viewpoint, "efficiency" could be defined as a dimensioned ratio. This ratio can only be of use if there is a comparable ratio (previous time period, similar organization's operation, etc.). Standing alone any assessment of efficiency has no meaning. Only through comparison with standards, history, or other comparable organizations does a measure of efficiency tell management anything of value.

E. First Definition of Effectiveness.

Effectiveness is most commonly defined as the ratio of actual results (outcomes) to some stated end objectives or goals:

$$\text{Effectiveness} = \text{Results} / \text{Objectives}$$

Common units of measure are required for both the results and the objectives in this ratio, but they need not be a monetary unit(s). The evaluation of effectiveness requires that specific, measurable program or project objectives be defined - a necessary, but often extremely difficult task. The stated objectives, from this view point, can be arbitrary and imposed from above.

Example:

Objective = Station XYZ will submit five (5) reports on topic ABC by 30 June 1979.

Results = By 6/30/79 four (4) reports on ABC were written and submitted by XYZ.

Effectiveness = $4/5 = .80$ (or 80%).

F. Second Definition of Effectiveness.

The preceding definition of effectiveness as the ratio of achieved results to some stated end objective or goal leaves much to be desired. There appears to be excessive room for arbitrary definition and the possible omission of a reference for evaluation. For example, agency management could have stated the objective as the submission, by Station XYZ, of only three (3) reports by 6/30/79. If there were an actual result of four (4) completed, then management could claim the following:

$$\text{Effectiveness} = \text{Achieved Results/Objective} = 4/3 = 1.33 \text{ or } 133\%$$

From management's viewpoint the reporting was effective, as defined, and if the data were available the reporting should, hopefully, prove efficient upon comparison to similar activities. However, from a different viewpoint (governmental, national, general public) how would the activities effectiveness be evaluated? How should it? What would be the "ground-rules"? Perhaps, in this example, no one uses the submitted reports. The four reports have no measurable effects at all! Possibly, in the extreme, the only result of their creation is a measurable imposition of a need for their storage or disposal.

The flow-system concept of a project or program previously presented provides an orientation for consideration of these questions. The reporting activity can be viewed as converting "social" resources (Inputs) into certain "social" returns (Results, Effects).* This view expands the first definition of effectiveness (Results/Objectives) to a consideration of the relation of the results (returns, effects) to the resources (inputs) required.

[* Note - "Social" as used here refers to a general, aggregated, national, overall and public viewpoint].

Effectiveness now becomes defined as:

$$\text{Effectiveness} = \text{Results/Resources}$$

Although all social resources consumed by a program are not usually measured or accounted for (even in non-monetary terms), the monetary cost of resources provides a base-line for evaluation. In fact, the resources required by an activity do not have to be measured in monetary terms, but they do have to be measured (in some unit) for any evaluation or assessment of effectiveness to be possible. Since money is the usual common measure of resources, nearly all evaluations express the resource usage in monetary terms. Likewise, all the results or social returns from a program are not usually measured or accounted for, but for evaluation there must be at least some, although partial, measurement. There are two basic approaches to effectiveness assessment open to the evaluator - cost-effectiveness and benefit-cost analysis. The major distinction between the two is that cost-effectiveness analysis* primarily deals with situations in which the input resources are measured in monetary terms and the results (for many reasons) are not, while benefit-cost analysis addresses activities where both portions of the result/resource ratio are expressed in monetary units. The current level of effectiveness assessment in public sector projects and programs is mainly focused at cost-effectiveness analysis although some, but a small proportion, of programs are amenable to benefit-cost analysis.

[* Note - "Analysis" and "evaluation" are used as synonymous terms in this and following text]

G. Cost Effectiveness

There are two basic approaches within cost-effectiveness analysis/evaluation:

- (1) fixed-cost, maximum effectiveness.
- (2) fixed-effectiveness, minimum cost.

In either case a relevant measure of effectiveness must be defined (casualty rate, response time (hrs), counter measure options, prisoners released) and the costs of resource inputs required by the different alternatives established. The definition of a relevant effectiveness measure is the critical requirement. Failure to do so can often lead to "a numbers game" which reflects little about the effectiveness of the activity.

In any application of cost-effectiveness analysis, it is important to realize that the question "are the results worth the resources expended?" is implicitly answered in the affirmative. However, the causal link (T) between the project outputs and the results must be explicitly shown or there is no effectiveness. A primary concern and necessary outcome of a cost-effectiveness analysis is the establishment of this causal link.

H. Establishing The Causal Link.

Some possible approaches to establishing that the outputs (reporting) has caused some result/effect are:

- Observation
- Content analysis of documents
- Testing
- Records search
- Interviews
- Questionnaires
- Sociometric choices
- Laboratory experimentation
- Game playing
- Physical examinations
- Physical evidence
- Attitude tests
- Opinion polls

The mission here is to establish a "reasonable cause to believe (RCTB)" or probability that the outputs had an effect. It is unlikely (except in a few, special situations) that absolute proof of effect will be possible. For this

reason, the analysis/evaluation of effectiveness requires that all parties involved work from a "positive-constructive-competitive" point of view (as in scientific investigation). This requires that those with different and/or opposed positions respond by offering argumentation/support for their respective positions. The parties respond to the cases being built as the analysis/evaluation warrants and not to "vested" or "self" interests. If this mode of operation can not be obtained, then there is little value to any evaluation effort. A similar "positive-constructive-competitive" environment for value (shadow price) determination in benefit-cost analysis/evaluation is discussed below.

I. Benefit-Cost

The question "are the results worth the resources expended?" can only be answered if the analysis/evaluation is able to:

- (1) establish a causal relation between program outputs and certain effects or results.
- (2) derive economic measures for both the social costs of the activity and the social benefits of the results - from the public (taxpayer's) point of view.

In this regard benefit-cost analysis is an approach, based upon a set of economic analysis concepts, that can aid in justifying the use and allocation of public resources to different programs. It is an approach that can aid top level management in justifying agency budgetary requests - ranking of ZBB decision packages [OMB A-115]. The B/C approach must function from a "positive-constructive-competitive" viewpoint - as discussed above. The first step is to establish (RCTB) that the outputs "cause" certain effects.

The second implementing step in benefit-cost analysis is the determination and "valuation" of the benefits and costs involved for the activities evaluated. There are economic and non-economic aspects to both the benefits and the costs when assessed from a public or social viewpoint. The costs are often easier to

establish as the resources expended (\$, personnel) can be accounted for and provide a base-line. This base-line may be adjusted (up or down) for social costs of a non-market derived nature since the market costs of the inputs may not truly reflect their social cost. The end result would be the "shadow price" of the costs for each viable alternative being considered in the analysis.

The benefits, being more in question, are "derived" or established in three major areas:

- "Market" value - the price for the results, effects willingly incurred in "market" transactions by the public - charge-backs, fees-for-service, etc.
- Cost reductions/avoidances - the currently borne social costs/expenditures that would be reduced or avoided by the results, effects - savings in current expenditure levels, lower error rates, fraud, etc.
- Indirect, intangibles - "values" such as "quality-of-life", "independence", "peace", "feeling of security", "cultural identity", etc., which are agreed (by most) to exist, but are extremely difficult to quantify/monetize - this category includes legislatively mandated (Federal, State) goals or services that must be made available.

As in the case of the social costs of the alternatives, the end result of consideration of the above three areas ("market" value, cost/avoidance, intangibles) would be the derivation of the "shadow price" of the benefits for the results of the activities outputs. These shadow prices are an indication of the "worth" of the various output results. They should not be taken as a definitive and absolute value measure, but rather a dynamic, working statement of the value seen in the alternatives considered. For this reason, benefit-cost analysis should and must be an overt and open process. The assumptions and analysis must be available for consideration and comment by as wide an audience as possible - the "positive-constructive-competitive" viewpoint.